TOWN OF LUNENBURG
Department of Public Works

PAVEMENT MANAGEMENT PLAN

March 2016

Creation of a Plan

- Why have a plan?
- The Town first developed a Pavement Management Plan in 2009
- This plan was updated in 2015
- The plan is a system which provides an objective way of programming roadway improvements with the goal of maximizing available resources & extending the life of the pavement system.

The Plan

- The system establishes a baseline condition of roadways which is used to establish a list of prioritized improvement recommendations.
- Roadway segments are prioritized according to a formula that includes:
  - Functional Classification
    - Roads are classified in a hierarchy according to how they are used
    - A higher priority is given to roads that carry higher volumes of traffic
  - Pavement Defect Value

Functional Classification

1. **Main Road** – Typically contains high traffic volume, and either permits traffic flow from one main road to another, or acts as an inter-town connector between the two. **Example: Lancaster Avenue**

2. **Secondary Main & Secondary Road** – Typically contains higher traffic volume than either a collector road or a local road with less volume than a main road, also acting as a connector between main roads. **Example: Sunnyhill Road**

3. **Collector Road** – Typically contains lower traffic volume than either secondary main roads or main roads and permits traffic flow between main roads or secondary roads and local roads. **Example: Hollis Road**

4. **Local Road Over 1000 ft.**– Typically contains the lowest traffic volume of all roads and either permits traffic flow from any of the above roads to residential sub-divisions or acts as a connector between sub-divisions. **Example: Broadmeadow Drive**

5. **Local Road Under 1000 ft – Example: Windermere Drive**

ROAD CLASSIFICATION
Main Roads

- Chase Road/Rt 13/Electric Avenue
- Lancaster Avenue
- Leominster Road
- Leominster/Shirley Road
- Townsend Harbor Road
- New West Townsend Road
- Summer Street
- Northfield Road
- Reservoir Road

ROAD CLASSIFICATION
Secondary Main & Secondary Roads

- Arbor Street
- West Townsend Road
- Holman Street
- Flat Hill Road
- Goodrich Street
- Lakefront
- Mulpus Road
- Main Street
- Pioneer Drive
- Sunnyhill Road
- West Street
- Whalom Road
- White Street

ROAD CLASSIFICATION
Collector Roads

- Beal Street
- Burrage Street
- Chestnut Street
- Eastern Avenue
- Elmwood Avenue
- Hollis Road
- Highland Street
- Howard Street
- Kilburn Street
- Oak Avenue
- Page Street
- Pine Street
- Pleasant Street
- Pratt Street
- Prospect Street
- School Street
- Sunset Lane
- Turkey Hill Road
- Upland Avenue
- Whiting Street
- Young's Road

ROAD CLASSIFICATION
Local Roads
(over 1000 ft. +/-) (SAMPLE)

- Broadmeadow Drive
- Canterbury Drive
- Connel Drive
- Cove Road
- Charlton Street
- Easterbrook Road
- Fairview Road
- Fish Street
- Bigson Street
- Gilchrest Street
- Hemlock Drive
- Horizon Island Road
- Houghton Mill Road
- Island road
- Laurel Lane
- Longwood Drive
- Maple Parkway
- May's Field Road
- Old Farm road
- Penninsula Drive
- Pierce Avenue
- Pine Acres Road
- Pine Grove Road
- Richards Way
- Robbs Hill Road
- Rolling Acres Road

ROAD CLASSIFICATION
Local Roads
(Under 1000 ft. +/-) (SAMPLE)

- Andrew Terrace
- Autumn Drive
- Baker Street
- Beachview Drive
- Birth Island Way
- Boucher Road
- Brookview Terrace
- Brown Avenue
- Burke Street
- Cliffview Terrace
- Clifton Road
- Country Road
- Cove Terrace
- Crescent Road
- Crescent Terrace
- Crest Avenue
- Crocker Avenue
- Cushing Lane
- East Street
- Elizabeth Street
- Fitchview Avenue
- Florence Street
- Francis Avenue
- Gabes Place

What type of road defects were looked at in the survey?

- Random/Longitudinal Cracks
- Utility Cuts/Other Patches
- Raveling, Shoving, Pushing
- Main Line Trenches
- Pot Holes
- Rutting
- Alligator Cracks

Random/Longitudinal Cracks

- Random cracks are transverse cracks caused by seasonal elongation and contraction of the pavement. These will occur within a few years of any new bituminous pavement.

Utility Cuts/Other Patches

- These are sections of pavement that have been repaired with new bituminous concrete pavement.

  (i.e., small gas/water leaks)

Raveling, Shoving, Pushing

- Raveling occurs when sections of the top pavement layer become loose and separate from the binder. It indicates deteriorating bond between pavement layers.

Main Line Trench

- Main line trenches are longitudinal sections of pavement that have been repaired with new bituminous concrete pavement usually after a main line utility repair.

Potholes

- A crater like hole of varying size caused by freezing and thawing of the road surface particularly in areas of other defects, cracks, etc.

Rutting

- Longitudinal depressions, “wheel ruts”, exist in travel lanes or edge of roadway. Due primarily to repetitive pressure along one line of travel causing improper sub base to compact and/or move laterally.

Alligator Cracks

- Also called “spider webbing” & often found at or around manholes, catch basins, where driveways meet roads, and/or where the pavement is too thin or worn.

The Original Plan

- A formula was then generated to provide a weighted rating for each road segment based upon classification and defect.
  - This weighted rating was then used to determine the prioritization of road maintenance work
  - This data was used as the basis for roadway spending in FY10 – 15
  - Projects included: next slide

Year	Chapter 90	Additional Aid	Operating Budget	Total
2010	$ 319,828.00		$ 70,000.00	$ 389,828.00
2011	$ 329,794.00		$ 70,000.00	$ 399,794.00
2012	$ 426,148.00		$ 70,000.00	$ 496,148.00
2013	$ 424,050.00		$ 70,000.00	$ 494,050.00
2014	$ 422,130.00	$ 63,000.00	$ 107,215.00	$ 592,345.00
2015	$ 630,692.00	$ 63,069.00	$ 241,490.00	$ 935,251.00

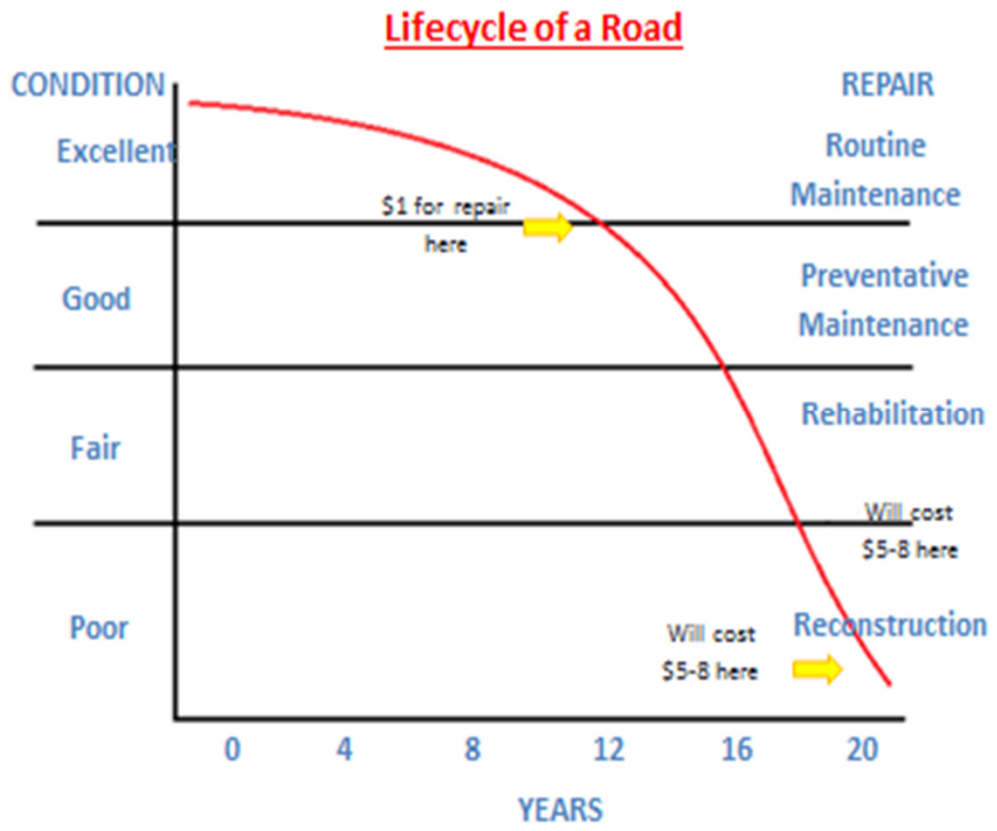
Note: in FY2015, incoming Governor Baker made good on his campaign promise to release the additional $100M in Chapter 90 Funding set aside in the State's FY2015 Budget.

Projects completed 2010 - 2016

LEOMINSTER-SHIRLEY ROAD	2010	
WEST STREET	2010	
NORTHFIELD ROAD	2010	
GOODRICH STREET	2010	
LANCASTER AVENUE	2011	
NEW WEST TOWNSEND ROAD	2011	
NORTHFIELD ROAD (PARTIAL)	2011	
LANCASTER AVENUE	2012	
NEW WEST TOWNSEND ROAD	2012	
RESERVOIR ROAD	2013	
NEW WEST TOWNSEND ROAD	2013	
LAKEFRONT	2013	
CHASE ROAD	2013	
NORTHFIELD ROAD	2014	
GOODRICH STREET	2015	
HOWARD STREET	2015	WRRRP
RESERVOIR ROAD	2015	WRRRP
ARBOR STREET	2015	WRRRP
PAGE STREET	2015	WRRRP
KILBURN STREET	2015	WRRRP
WEST STREET	2016	
HOWARD STREET	2016	
WEST TOWNSEND ROAD	2016	
NORTHFIELD ROAD	2016	
FLATHILL ROAD	2016	

The Revised Plan

- In Summer 2015, each roadway in the town was re-inspected to update the data last collected in 2009.
  - Based upon the new inspection data, a Pavement Condition Index (PCI) was calculated.
  - This index expresses the relative condition of each roadway on a scale of 0 (worst) to 100 (best)
  - The PCI is used to estimate the appropriate repair treatment for each roadway.
- Each roadway was then weighted by its condition & functional classification to develop a prioritize list of roadway repairs
  - Similar to the original methodology, but different in that repair treatment is now being factored into the equation (next slide)
  - Scale of 30 (highest priority) to 0 (lowest priority)
- The appropriate repair treatment and the Town's current on-call paving contract prices were used to estimate a repair cost for each roadway segment, which is the basis for the development of a revised multi-year capital improvement plan


Lifecycle of a Road
CONDITION
REPAIR
Excellent
Routine Maintenance
$1 for repair here
Good
Preventative Maintenance
Rehabilitation
Fair
Will cost $5-8 here
Poor
Will cost $5-8 here
Reconstruction
0
4
8
12
16
20
YEARS

Existing Conditions Summary

Estimated Road Repair Needs

(Excludes Chase Road and Summer Street TIP Projects)

Repair Method	Length (Miles)	Cost	% by Length	% by Cost	Cost per Mile
Reconstruction	0.6	$190,000	0.7%	2.1%	$317,000
Mill, Level & Overlay	40.7	$7,730,000	47.2%	85.8%	$190,000
Overlay	11.8	$960,000	13.7%	10.7%	$81,400
Crack Seal	9.4	$130,000	10.9%	1.4%	$13,900
Defer Maintenance	23.8	$0	27.5%	0%	$0
TOTALS:	86.3	$9,010,000			

Repair Needs = Approx. $9 Million
(Amount needed to reach 100 PCI Rating)

WORLDTECH ENGINEERING

Costs shown reflect the Town's current on-call contract pricing plus a 20% contingency

Existing Conditions Summary by Repair Method

- Based upon the updated roadway inspection data & Town's current on-call paving contract, investing $9M today would bring the town to a perfect state of repair.
- As shown in the table, as roadways deteriorate further, the cost per mile for rehabilitation increases dramatically.
- This is why it is important not to do all of the worst roads first, but rather have a blend of treatments.

Existing Conditions Summary

Estimated Road Repair Needs

(Excludes Chase Road and Summer Street TIP Projects)

Functional Classification	Length (Miles)	Average PCI	Total Cost	% by Length	% by Cost
Main	22.1	70	$2,115,000	25.6%	23.5%
Secondary Main	1.4	36	$250,000	1.6%	2.8%
Secondary	18.2	66	$1,520,000	21.1%	16.9%
Collector	16.7	58	$1,960,000	19.4%	21.7%
Local	27.9	53	$3,165,000	32.3%	35.1%
TOTALS:	86.3	62	$9,010,000		

WORLDTECH ENGINEERING

Main Roads/ Secondary Main

- Main roads account for approximately ¼ of the roads under the Town's jurisdiction
- They also account for about ¼ of the Town's roadway repair needs
- The Town's Main roads are in good condition, having an average PCI of 70.
- The only Secondary Main in town is Arbor Street, and it is in poor condition and has a PCI of 36.

Secondary Roads & Collectors

- Another 40% of roadways are classified as Secondary Roads & Collectors
- These roadways represent slightly less than 40% of the repair need
- On average, Secondary Roads are in fair to good condition, with an average PCI of 66
- Collectors are in slightly poorer repair with an average PCI of 58

Local

- Local streets make up 32 % of the town's roadways
- They account for 35% of the total roadway repair backlog
- On average, local streets are in fair condition with an average PCI of 53

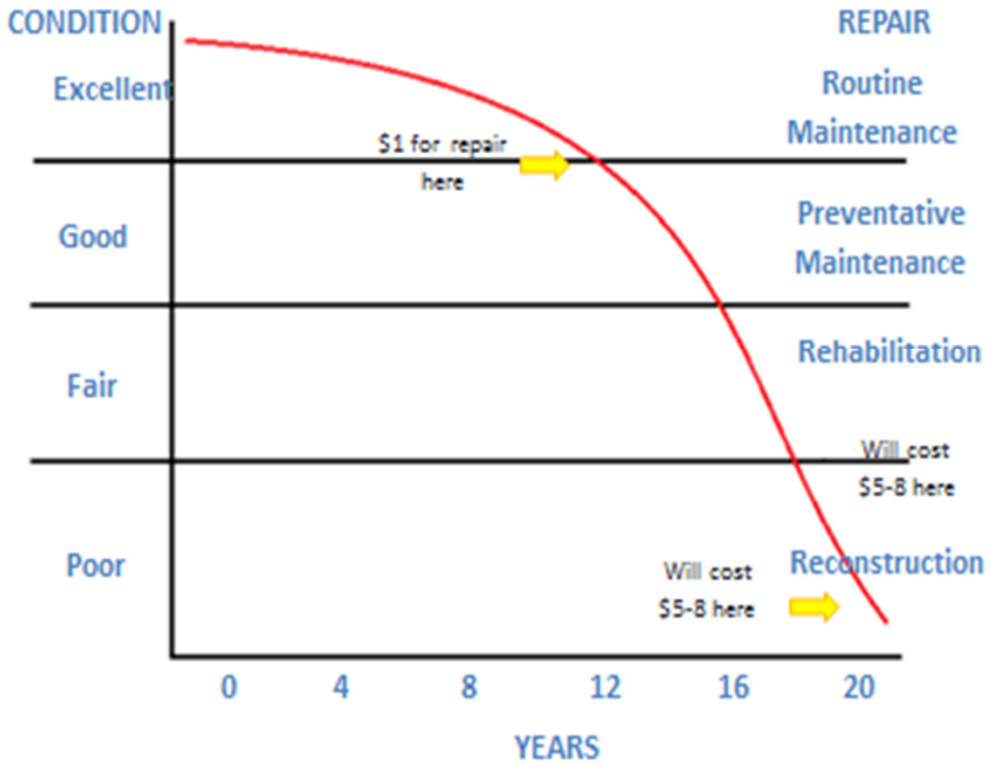
Problems & Solutions

- The Board, in its capacity as Road Commissioners, determined that:
  - A Long Term Funding Strategy needed to be developed
    - Strategy should endeavor to maintain roads at PCI = 70
    - Consideration needed to be given to providing regular funding for Local Roads
    - A sustainable funding plan needed to be put in place that regularly and routinely addressed all roadway maintenance needs
- The current level of spending will not achieve the maintenance goal as most of the annual funding goes toward Main and Secondary Roads, leaving little left for Local Roads
  - The vast majority of complaints received are about the condition of Local Roads

Development of Long Term Funding Strategy

- As the condition of a roadway worsens, the cost of bringing it back to a state of good repair increases dramatically.
- If only the worst roads are repaired first, roads that can be rehabilitated more economically now will be more expensive to repair if left to further deteriorate.
- An effective Pavement Management Plan applies a blend of repair strategies to optimally distribute the available budget.

Lifecycle of a Road



CURRENT/ EXISTING FUNDING

- The Town's current program is funded via:
- FY Operating Budget
- State Aid, Chapter 90

FY2016		
Operating Budget	$	250,000.00
Chapter 90	$	416,626.00
total:	$	666,626.00

Program Goal is PCI = 70

- Annual cost to meet goal is $1.0 – 1.2M
- Current spending level is $667k
- Deficit of $333k
- Current level of spending is barely sufficient only to
- address Main, Secondary Main, Secondary & Collectors
- Current level of spending is insufficient to address local roads
- Board requested a short-term, impactful solution to address local roads

Program Goal is PCI = 70

- For Local Roads:
  - There are 117 road segments, with 58 (just under 50%) having a PCI of less than 70
  - The cost to improve these 58 segments is $3,123,063
  - There are 41 segments with a PCI of 71 -89, which have associated improvement costs of $257,300
  - There are 18 segments with a PCI of 90 or higher, presently with no associated improvement costs.
  - The total costs to make all improvements is $3,380,363
    - Addresses roads with current PCI of 71 -89, to insure they stay at 70 or better throughout the life of this funding scendario

Funding Alternative for Local Roads

- $3.4M in maintenance costs
- $510,000 in anticipated needed Stormwater Improvements
  - Assumes that 600 of the Town's 1,100 catch basins are included in the proposed work area and on average would need $850 worth of maintenance.
  - The construction of swales and their seeding can be completed within the already calculated costs on a limited basis.
- Total project cost $3,910,000

Funding Alternative for Local Roads

- Request support for Voter Authorized Debt Exclusion
  - One time request to provide funding infusion to plan
- Work to be completed over 3 -4 year period (FY17 – 20)& financed over a 7 (FY18 – 24) year period
- Thereafter, funding for maintenance will be included in Operating Budget
- Increase Operating Budget Appropriation by $50k per year until we have $1 - $1.2M available per year
  - First $50k of Motor Vehicle Excise Tax devoted to increase funding, beginning in FY18 -24 (commit to in a financial policy)
  - Roughly equivalent to the current annual growth in MVX
- All future roadway maintenance needs will be addressed within Operating Budget & Chapter 90 Allocation

Funding Scenario

Scenario Assumptions

Amount	**3,910,000**
Amount Financed	**3,910,000**
Term/years	7
Rate	3.000%
Amortization	straight line

	Year	Balance	Principal	Interest	FY Total	Impact to AVG SFH FY 16 Base	Quarterly	Monthly	Daily
2018	1	3,910,000	558,571	117,300	675,871	$ 144.78	$ 36.20	$ 12.07	$ 0.40
2019	2	3,351,429	558,571	100,543	659,114	$ 141.19	$ 35.30	$ 11.77	$ 0.39
2020	3	2,792,857	558,571	83,786	642,357	$ 137.60	$ 34.40	$ 11.47	$ 0.38
2021	4	2,234,286	558,571	67,029	625,600	$ 134.01	$ 33.50	$ 11.17	$ 0.37
2022	5	1,675,714	558,571	50,271	608,843	$ 130.42	$ 32.61	$ 10.87	$ 0.36
2023	6	1,117,143	558,571	33,514	592,086	$ 126.83	$ 31.71	$ 10.57	$ 0.35
2024	7	558,571	558,571	16,757	575,329	$ 123.24	$ 30.81	$ 10.27	$ 0.34
	Total		**3,910,000**	**469,200**	**4,379,200**				

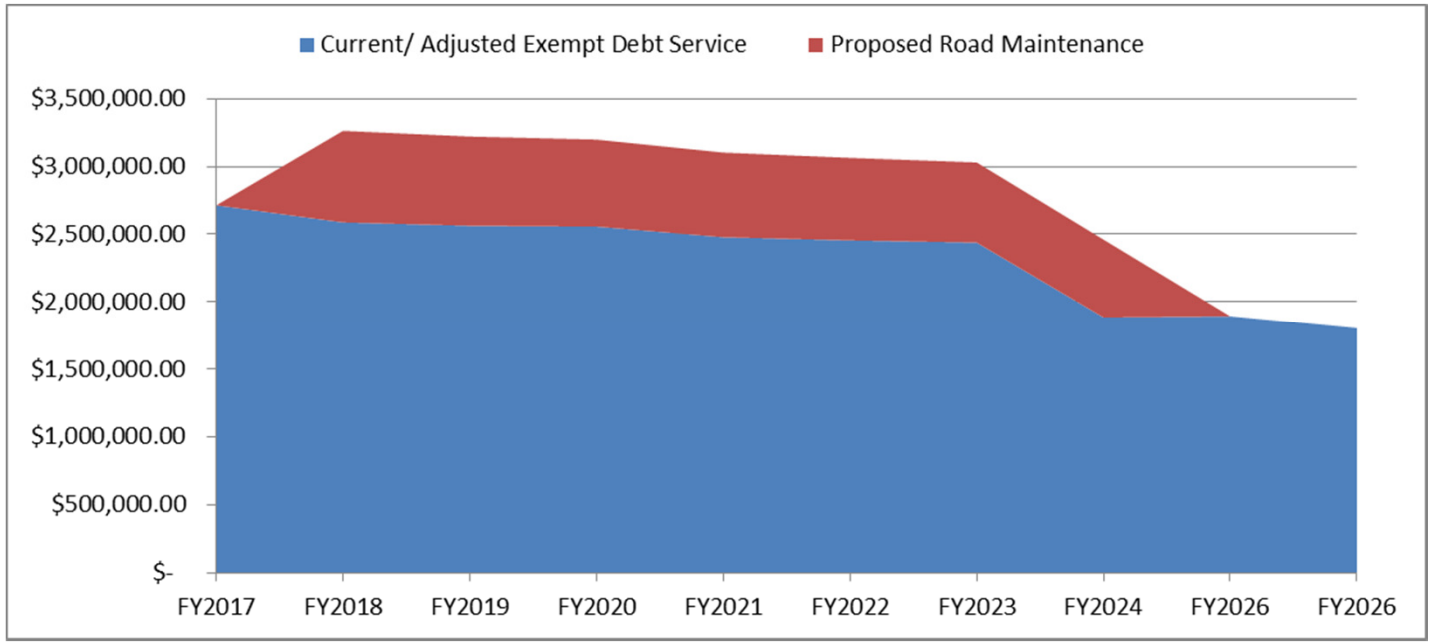
Summary

- The Pavement Management Program is an inventory of each roadway under the Town's jurisdiction
- Based upon pavement distressed observed in the field, a PCI is calculated, rating the roadway's condition on a scale of 0 (worst) to 100 (best)
- This index is then weighted by the roadway's functional classification to develop a priority index on a scale of 30 (highest priority) to 0 (lowest priority)
- The current policy of weighting local streets lowest, and instead allocating funds first to main roads and collectors, which everyone uses, does not adequate address the needs of residents

Summary

- The PCI and other inventory data are used to determine the appropriate treatment to rehabilitate each roadway
- Based upon the determined treatment, an approximate cost can be calculated for each roadway segment based on unit costs and a contingency
- Costs shown reflect the Town's current on-call contract pricing plus a 20% contingency
- Both a commitment to increase the annual spending and a one-time infusion of new funding (debt exclusion) is needed to get the Pavement Management Program on a sustainable track.
- The cost of the proposed debt exclusion for the average SFH is $145/ year 1

Current Exempt Debt + Proposed Road Maintenance



Average Tax Bill, Exempt Debt